of the board 4 is recognized by recognizing the XY coordinate position in the orthogonal XY directions on the stage 9 of the board 4 and the rotational position relative to the origin of the XY coordinate system on the basis of an image 606 obtained by the camera 604. On the other hand, a mark 608 or a circuit pattern for recognizing the position of the IC chip 1 sucked and held by the bonding tool 8 is recognized by an IC chip position recognizing camera 603 as shown in Fig. 56A, and the position of the IC chip 1 is recognized by recognizing the XY coordinate position in the orthogonal XY directions of the IC chip 1 and the rotational position relative to the origin of the XY coordinate system on the basis of an image 607 obtained by the camera 603 as shown in Fig. 56B. Then, the bonding tool 8 or the stage 9 is moved on the basis of the position recognition results of the board 4 and the IC chip 1 to perform positional alignment so that the electrodes 2 of the IC chip 1 are positioned on the corresponding electrodes 5 of the board 4, and thereafter, the IC chip 1 is pressed against the board 4 by the heated bonding tool 8.

At this time, the bump 3 is pressed against the electrode 5 of the board 4 in a manner that a head portion 3a of the bump 3 is deformed as shown in Fig. 41A and Fig. 41B. At this time, as shown in Fig. 39A and Fig. 39B, the inorganic filler 6f in the thermosetting resin 306m is

forced outwardly of the bump 3 by the pointed bump 3 that enters the thermosetting resin 306m at the beginning of the bonding. Moreover, as shown in Fig. 39C, there is produced the effect of reducing the connection resistance value by the arrangement that the inorganic filler 6f does not enter the space between the bump 3 and the board electrode 5 due to this outward extruding action. At this time, even if a certain amount of inorganic filler 6f enters the space between the bump 3 and the board electrode 5, there is no problem by virtue of the arrangement that the bump 3 is brought in direct contact with the board electrode 5.

At this time, a load to be applied via the IC chip 1 to the bump 3 side differs depending on the outside diameter of the bump 3. The head portion 3a that belongs to the bump 3 and is bent and folded is required to receive a load to the extent that the head portion is deformed without fail as shown in Fig. 41C. This load is required to be 20 (gf per bump) at the minimum. That is, the resistance value becomes excessively increased to a resistance value of 100 mmΩ/bump or higher when the load is smaller than 20 (gf per bump) according to the graph of a relation between the resistance value and the load in the case of the bump of an outside diameter of 80 μm to cause a practical problem, and therefore, a load of not smaller than 20 (gf per bump) is preferable, as shown in Fig. 52.

Fig. 53 is a graph showing a region of high reliability based on a relation between bumps of outside diameters of 80 μm and 40 μm and minimum loads. According to this graph, it is presumed that the bump of an outside diameter of not smaller than 40 μm is preferably loaded with a minimum load of not smaller than 25 (gf per bump) and the reliability is high when the minimum load is not smaller than about 20 (gf per bump) in the case of the bump of an outside diameter smaller than 40 μm. It is also presumed that, when the bump outside diameter is reduced to less than 40 μm with a reduction in lead pitch in the future, the load tends to reduce in proportion to the second power of the projected area of the bump depending on the projected area of the bump. Therefore, it is preferable that the minimum load applied to the bump 3 side via the IC chip 1 needs to be preferably 20 (gf per bump) at the minimum. The upper limit of the load applied to the bump 3 side via the IC chip 1 is set to the extent that none of the IC chip 1, the bump 3, the circuit board 4, and so on is damaged. According to circumstances, a maximum load may sometimes exceed 150 (gf per bump). It is to be noted that the reference numeral 6s in the figure denotes a resin resulting from the thermosetting resin 306m that has been melted by the heat of the bonding tool 8 and thereafter thermally hardened out of the thermosetting resin sheet 6.